



Potential Effect of Medical Insurance on Medicare: Evidence from China

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Abstract

Background: With the increased range of medical insurance coverage in China, the proportion of medical expenditure shouldered by individuals is declining. The problem is the rapidly growing scale of medical expenditures challenges the sustainability of medical insurance funds.

Methods: This study used the Heckman selection model, survival analysis, and ordered probit model to evaluate the effect of medical insurance on the expenditures in outpatient and inpatient health care, survival time, and improvement of self-rated health of test subjects, respectively.

Results: Medical insurance exerts a differential effect on the expenditures in outpatient and inpatient health care. On average, the expenditures in outpatient and inpatient health care of test subjects participating in premium health insurance plans increased by 38.6% and 72.6%, respectively. Participation in medical insurance plans exhibits no significant correlation with the survival time of test subjects, but their self-rated health shows a significant correlation ($P < 0.01$).

Conclusion: Although medical insurance does not significantly reduce mortality or prolong the survival time of test subjects, it improves their health status. This study suggests that the Chinese government should eliminate deductible medical insurance payments and utilize medical resources on minor ailment treatment and disease prevention to improve the health status of people.

Keywords: Medical insurance, Medicare, Self-rated health, Survival analysis

Introduction

After years of reform in China, the coverage of population with medical insurance has been expanded to form two major medical insurance systems, namely, employee medical insurance and resident medical insurance. Compared with the former, payment of the latter is lower with a smaller scope as well as lower reimbursement and upper limit. With the rapid expansion of coverage benefits of medical insurance, the ratio of personal burden for medical expenses in China has declined (Fig. 1). Individual payments for medical expenses reduced from 52.2% in 2005 to 32.0% in 2014. Meanwhile, the average medical expenditures per capita in China increased from 80.85

USD in 2005 to 415.28 USD in 2014. The average annual growth of medical expenditures per capita in China was 16.3%, which was higher than the per capita disposable income growth rate of 12.5% and per capita GDP growth rate of 14.1% in China during the same period (1).

Although medical expenses increase rapidly, China adopts a medical insurance system designed to focus more on treatment than prevention. For example, individuals are required to shoulder the cost of common diseases in outpatient clinics, and outpatient expenses of only a few specific diseases can be partially reimbursed. The medical insurance reimbursement policy in China also

requires deductible payments. The government only reimburses part of a claim that is above the deductible payment amount. This insurance policy aims to centralize a great extent of medical

resources against major illness risks. However, the arrangement of this policy may also increase the overuse of treatments for ailments and the production of medical waste (2).

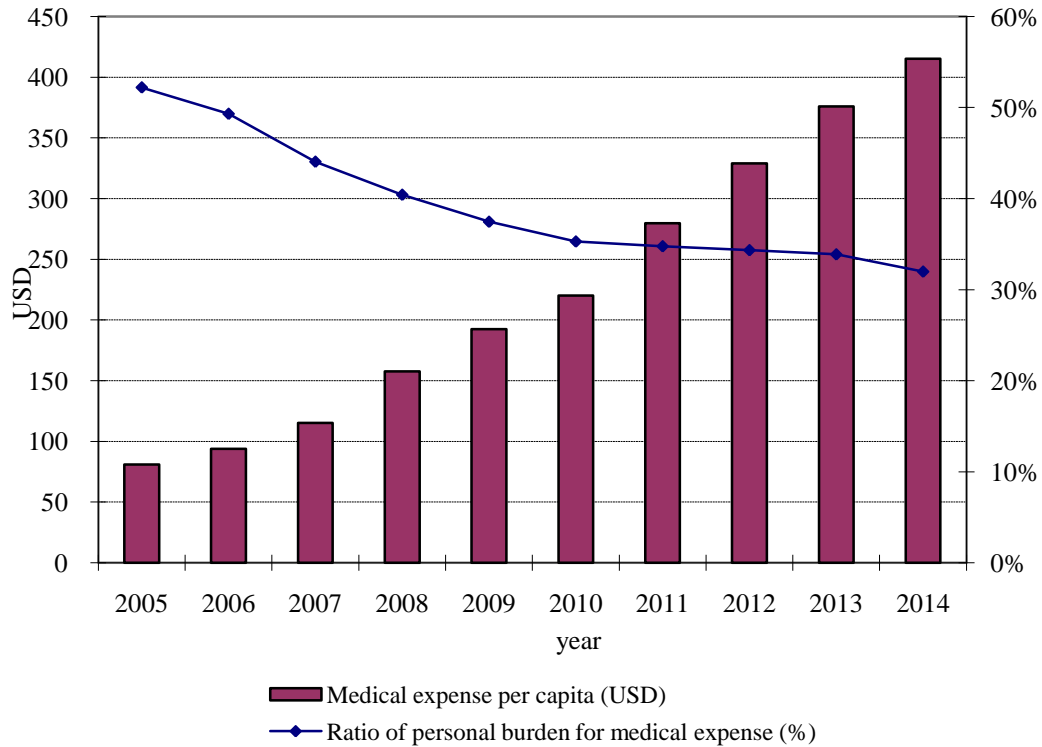


Fig. 1: Medical expense per capita and ratio of personal burden for medical expense in China

Note: 1) The data are obtained from *China Statistical Yearbook 2015*. 2) The currency unit was converted from Chinese Yuan to US dollar by using the annual average exchange rate in the corresponding year reported in the study (<http://www.bankofcanada.ca/rates/exchange>), similarly hereinafter

Medical insurance is a financial mechanism that reduces risk of medical expenditures, enhances accessibility of health care by lowering economic barriers for medical treatment, and provides a positive effect on the health of residents. Patients with health insurance benefit from lower cost of medical services than those who shoulder the medical expenses themselves. However, they may create moral hazard in the market by distorting the price for medical services, causing waste of resources (3, 4).

The most notable study on the effect of health insurance on medical expenditures was the RAND health insurance experience reported in the 1970s; various health insurance schemes were

designed and their effect on the health of patients and utilization of medical services were evaluated (5). The RAND study found that the ratios in utilizing medical services such as number of visits and health care expenditures of consumers who were randomly assigned to a free health care plan were respectively 67% and 46% more than those of consumers who paid 95% of their health insurance plan (6). Apart from the experimental data of RAND, studies used various types of data to evaluate the effect of health insurance on medical care. The consensus reached was that health insurance caused the increase of medical expenditures (7-15). For example, the study that used USA National Health Interview Survey data re-

vealed that health insurance sharply increased the utilization of medical services (16).

Research on the effect of insurance on health have not drawn unanimous conclusion. Some reports showed that health insurance improved the insured's health (17-22). The health insurance scheme with higher compensation encouraged the insured to use health care resources more frequently. Findings from U.S. Census Bureau data indicated that patients without health insurance were at a higher risk of death than those who have (17). Other studies suggested that health insurance exerts no or even a negative effect on the insured's health (23-28). Even among the insured, differences in co-payments, deductibles, and other features affected service use. Nevertheless, evidence was insufficient to conclude that free health coverage improved the health conditions of patients (5).

Although research verified that health insurance increased in medical expenditures, these studies did not address whether the increase in medical expenditures is caused by increased legitimate demand or waste. The current study, which is based on existing literature, hypothesizes that availability of medical insurance increases medical expenditures. If health insurance does not significantly improve the health of the insured, then medical treatment provided by health insurance must be considered excessive and impractical. By contrast, if health insurance improves outcomes for reasonable medical needs, then increase in medical expenditures is justified.

This study assessed the effect of health insurance on the health of the insured based on their risk of death and their self-rated health. We find that medical insurance does not reduce the risk of death but improve the self-rated health of Chinese residents, thus leading to the conclusion that the existing medical insurance policy, which focuses on treatment of serious illnesses but ignores minor ailment treatment and disease prevention, may require adjustment.

Methods

Data resources and description

Data resources

Data for this study originated from the China Health and Retirement Longitudinal Survey (CHARLS), which mainly collected microdata from individual Chinese residents over 45 years old and their family. The baseline survey of CHARLS conducted from January to August 2011 included 10,257 families and 17,708 individuals. The follow-up survey was conducted from July to September 2014 and 3,085 individuals were listed as dead or missing status. The additional sample contributed to a total of 10,858 and 18,455 interviewed families and individuals, respectively. Contents of the CHARLS questionnaire included basic personal information, family structure, health status and daily life, health care and insurance, work and retirement, income and expenditures, assets and housing situation, and basic community information.

Dependent variables

To study if medical insurance affected medical expenditures, CHARLS investigated the total cost of the most recent visits for outpatient care of the insured and the medical cost for all hospitalizations in the past year as dependent variables. Table 1 presents the total cost of the most recent visits for outpatient care and the medical cost of inpatient care during the previous year for participants under different medical plans. The average expenses for outpatient care incurred by patients covered by employee medical insurance and resident medical insurance and those without insurance coverage were 273.66 USD, 144.53 USD, and 88.38 USD, respectively, with a decrease in the expenses for outpatient care. For the total medical cost of all the hospitalizations during the past year, the average costs for hospitalizations of residents with employee medical insurance and resident medical insurance and those without insurance coverage were 4535.20 USD, 2155.68 USD, and 2594.72 USD, respectively. Residents with employee medical insurance shouldered a higher cost of hospitalization than those with resident medical insurance and without insurance coverage. However, the difference in the average

cost of hospitalization between those with resident medical insurance and those without insur-

ance coverage was small.

Table 1: Comparison of medical expenses across different health insurance programs

Programs		Employee Medical Insurance	Resident Medical Insurance	No Medical Insurance
Hospitalization costs	Total hospitalization costs (USD)	4535.20	2155.68	2594.72
	Number of observations	364	1161	52
Outpatient costs	Total outpatient costs (USD)	273.66	144.53	88.38
	Number of observations	1302	8431	519

To evaluate if medical insurance improved the health of the insured residents, we used two variables: self-reported health status of test subjects (Table 2) and their survival time. If the test subjects died during the follow-up survey held in 2014, we recorded “0” for the survival status in our database and the duration from the participation in the survey to death. For test subjects who remained alive during the follow-up survey, we recorded “1” for the survival status.

Independent and control variables

The independent variables were the participation in medical insurance of the test subjects and three types of participation in medical insurances, namely, employee medical insurance, residence medical insurance, and no insurance. Protection in these three types of medical insurance was increased, with the highest reimbursement for the insured with employee medical insurance, relatively low reimbursement for those with resident medical insurance, and no reimbursement for those without any health insurance. Subjects participating in other commercial medical insurances were excluded from this study. We set up orderly dummy variables for test subjects participating in medical insurances (Table 2). Similar to those in published studies (2, 8-10, 29), the control included health, income, employment, and family

situation. Table 2 lists the specific descriptions and explains the statistical variables.

Research methods
Heckman selection model

In analyzing the effect of medical insurance on medical expenditures, the survey only obtained sample data of existing medical expenditures. However, the samples without any record of medical expenditures might be due to no illness and other reasons (e.g., one could not afford to pay for doctor appointments, inaccessibility and transport hurdles for medical services) affecting the identification of the real demands on health care consumption, thus generating sample selection bias. The Heckman selection model was used to solve the problem by dividing the health care consumption into two stages: decision to seek treatment upon the occurrence of medical needs and medical expenses after treatment.

The regression equation for the observable data of the total sample is as follows:

$$y = \beta X + v$$

Where y represents the medical expenses, and X represents the different reasons for the medical expenses. Some medical consumption demand could not be observed; therefore, the model should be rewritten as:

$$y = \begin{cases} y^* = \beta X + v & \delta Z + \varepsilon > 0 \\ 0 & \delta Z + \varepsilon \leq 0 \end{cases}$$

Table 2: Description of variables and statistics

Variables	Unit	Description	Mean	Standard deviation	Sample size
Outpatient costs	USD	Total cost of most recent visits for outpatient care (excluding hospitalization), taking the logarithm in empirical research	161.18	1682.71	10252
Hospitalization costs	USD	Medical cost for all hospitalizations during the past year, taking the logarithm in empirical research	2640.11	3960.38	1577
Survival time	Months	Continued survival time since the 2011 baseline survey	14.616	7.093	419
Survival status		Survival status of the 2014 follow-up survey; Dead = 0, Alive = 1	0.0235	0.1515	18373
Health status		Self-Reported Health Status; Very good = 1, Good = 2, Fair = 3, Poor = 4, Very poor = 5	3.369	0.873	35984
Insurance type		Types of health insurance; No insurance = 0, Resident medical insurance = 1, Employee medical insurance = 2	1.079	0.427	35404
Gender		Male = 0, Female = 1	0.522	0.500	36287
Age	Years	Calculated by subtracting the investigation date from the date of birth	59.49	10.21	36215
Place of residence		Rural Village = 0; Urban Community = 1	0.388	0.487	36234
Marital status		Married: Married with spouse present; Married, but not living with spouse temporarily, cohabitating Single: Separated, Divorced, Widowed, and Never married Single = 0, Married = 1	0.87	0.336	36260
Educational level		No formal education = 1; Home school = 2; Elementary school = 3; Middle school = 4; High school = 5; Vocational school = 6; Associate's degree = 7; Bachelor's degree = 8; Master's degree = 9; Doctoral degree = 10	2.832	1.566	36240
Work status		Working = 0; Not working = 1	0.667	0.471	35909
Disability		Including physical disabilities, mental retardation, vision problem, hearing problem, or speech impediment No = 0; Yes = 1	0.165	0.371	33716
Chronic disease		12 chronic diseases, such as hypertension and diabetes No = 0; Yes = 1	0.468	0.499	36051
Outpatient property		Outpatient medical facility property Public = 0; Private = 1	0.240	0.427	6107
Hospital property		Hospitalization medical facility property Public = 0; Private = 1	0.067	0.249	3285
Travel time	Hours	Travel time to the nearest medical facility	0.680	2.572	6883
Physical examination		Received a physical examination in the last two years. No = 0, Yes = 1 Never received physical examination = 3; did not receive physical examination in last two years = 2; more than one physical examination in the last two years = 1	0.436	0.496	35447
Smoking habits		Yes = 1; No = 0	0.346	0.476	32496
Drinking habits		Drinks any alcoholic beverages. Never = 0, less than once a month = 1, more than once a month = 2	0.593	0.869	35923
Exercise habits	Days	How many days do they play sports during a typical week, including vigorous activities, moderate physical effort, or walking	6.591	1.201	11536
Household expenditures	1000USD	Household expenditures in the last year	4.104	11.951	23605
Living area	m ²	Area of residence	117.86	76.61	33946
Family size	Persons	Number of household members	2.573	1.928	36041

Where y^* represents the observable sample, and Z represents the exogenous factors affecting the sample selection. Z should include some exogenous variables in addition to X . The Heck-

man two-stage modeling was used to estimate coefficient β as follows:

First, the dummy variable d of sample participation was configured. If y could be observed, then $d=1$. If y could not be observed, then

$d = 0$. With d as dependent variable, the probit model was used for all samples to estimate the sample selection equation.

$$d = \delta Z + \varepsilon$$

According to above equation, the simulation of the parameter was used to calculate vector γ .

$$\gamma = \frac{\phi(Z, \delta)}{\Phi(Z, \delta)}$$

In the above equation, ϕ and Φ represents the probability density function and cumulative distribution function of standard normal distribution, respectively.

Second, the observed sample was estimated as follows:

$$y^* = \beta X + \lambda \gamma + v$$

The consistent estimation β was obtained using the least squares method, and the significant test was used to determine the presence of selection bias using coefficient λ .

Survival analysis

Survival analysis is a common statistical method to study the lifetime and risk of death of the test subjects. Survival analysis mainly includes the Kaplan-Meier survival analysis and Cox's regression model.

The Kaplan-Meier survival model ranks the survival of test subjects in ascending order. Survival probability was estimated using the product-limit method to prepare the survival curve. Log-rank and other methods were also used to verify the differences of survival in different groups.

The Cox's regression model is one of the most popular semi-parametric survival analyses. The mortality function of the i th observation(s) of the model was described as

$$h(t) = h_0(t) \exp(\beta_1 x_1 + \beta_2 x_2 + \dots + \beta_m x_m)$$

Where h represents the hazard function, $h_0(t)$ represents the baseline of the hazard function, t represents the time, x represents the independent variables, and β represents the estimated coefficients. The advantage of the semi-parametric Cox's regression model is that it does not require

any basis risk function $h_0(t)$ to assume any form of parameter.

Ordered probit model

To evaluate the effect of medical insurance on self-rated health of the insured, the CHARLS data of self-rated health were divided into five categories: Very good = 1, Good = 2, Fair = 3, Poor = 4, and Very poor = 5 (Table 2). An ordered probit model was adopted to estimate the parameters because the dependent variables were discrete ordered data. The basic equation of an ordered probit model is

$$y^* = \beta X + \varepsilon$$

Where y^* represents the latent variable of the dependent variable of self-rated health y , X represents the independent variable, β represents the parameter to be estimated, ε represents a perturbed random variable, and the conditional distribution hypothesis of X based on ε is a standard normal distribution.

The observed y was determined based on y^* and the following rule:

$$y = \begin{cases} 1 & \text{if } y^* \leq \theta_1 \\ 2 & \text{if } \theta_1 < y^* \leq \theta_2 \\ 3 & \text{if } \theta_2 < y^* \leq \theta_3 \\ 4 & \text{if } \theta_3 < y^* \leq \theta_4 \\ 5 & \text{if } \theta_4 < y^* \end{cases}$$

Where θ represents the threshold value. The conditional probability function of y for X is $P(y = m | X)$ (where $m = 1 \dots 5$), and the maximum-likelihood method was used to estimate parameters θ and β .

Results

Effect of health insurance on medical expenses

This study used the Heckman selection model to estimate the effect of medical insurance on medical expenses. The variables of travel time, physical examination, place of residence, and work status affected the sample selection. However, they were also regarded as exogenous variables,

which were irrelevant to dependent variables. The results of the Heckman two-stage estimation in Table 3 indicated that LR and Wald statistics exerted a positive effect on the overall estimation.

Through the test of significance, inverse Mills ratio λ indicated a bias of sample selection in the model.

Table 3: Effect of health insurance on medical expenses measured

Independent variables	Model I: ln (outpatient costs)		Model II: ln (hospitalization costs)	
	First stage	Second stage	First stage	Second stage
Constant term	1.3860*** (0.0536)	2.5243*** (0.5940)	-1.5379*** (0.0561)	14.9224** (6.9266)
Insurance type	-0.0361 (0.0618)	0.3860* (0.2215)	0.00971 (0.0620)	0.7260*** (0.1486)
Gender	0.0961* (0.0549)	-0.1327 (0.2225)	-0.2273*** (0.0568)	-0.0768 (0.1491)
Age	0.0110*** (0.0028)	0.0357 (0.0260)	0.0092*** (0.0029)	0.0268*** (0.0101)
Marital status	0.0546 (0.0665)	0.5230 (0.3769)	0.0730 (0.0737)	0.2418 (0.1961)
Educational level	0.0334** (0.0167)	0.1388* (0.0714)	-0.0365** (0.0175)	0.2026*** (0.0431)
Disability	-0.0711 (0.1126)	-0.1253 (0.3452)	0.1972* (0.1184)	-0.4920* (0.1959)
Chronic disease	0.0750 (0.0940)	0.2039 (0.2407)	0.2835** (0.1150)	-0.4003** (0.1725)
Outpatient property		-1.0802*** (0.1968)		
Hospital property				-0.8397*** (0.3001)
Smoking habits	0.1446 (0.1031)	0.1287 (0.2908)	0.0956 (0.1229)	-0.0236 (0.1645)
Drinking habits	-0.0059 (0.0602)	0.13516 (0.13819)	0.0392 (0.0758)	-0.1251 (0.1051)
Exercise habits	0.0142 (0.0341)	0.02143 (0.19874)	-0.0459 (0.0358)	-0.0155 (0.0976)
Household expenditures	0.0124 (0.0085)	0.0639* (0.0388)	0.0211 (0.0048)	0.0390** (0.0166)
Living area	0.0001 (0.0004)	0.0004 (0.0017)	0.0001 (0.0004)	-0.0002 (0.0010)
Family size	-0.0009 (0.0181)	0.0041 (0.0643)	-0.0073 (0.0180)	-0.0666* (0.0379)
Travel time	0.0194 (0.0167)		-0.0862 (0.1894)	
Physical examination	-0.0176 (0.0472)		0.2390*** (0.0504)	
Place of residence	0.1074** (0.0482)		0.1013** (0.0506)	
Work status	0.2421*** (0.0485)		-0.3414** (0.0505)	
Mills λ		10.02***		-2.09***
Wald		84.78***		41.82***
Uncensored observations		7814		1031
Censored observations		12368		11495

Note: 1) Standard deviation is listed in parentheses; *, **, and *** denote the levels of significance test by 10%, 5%, and 1%, respectively. 2) Stata software was used for estimation in this study.

According to the parameters in Table 3, we estimated the findings and concluded the following:

1) The types of medical insurance significantly affect medical expenses. The more premium the medical insurance plans in which the residents participated, the higher the medical expenses. The types of medical insurance exerted a more significant effect on the cost of outpatient care. Participation in the more premium medical insurance plans had an average effect of 38.6% on the cost of outpatient care and 72.6% on the cost for hospitalization.

2) Other factors affecting the medical expenses are listed as follows. The variables, including gender, marital status, smoking habits, drinking habits, exercise habits, and living area of the test subjects, did not affect medical expenses. The cost for hospitalization was higher for older individuals, but age did not significantly affect the cost of outpatient care. Those with higher educational level and household expenditures pay higher outpatient and hospitalization costs. People with chronic diseases and disabilities had less hospitalization costs, but these variables did not significantly affect the cost of outpatient care. The lack of significant effect might be due to the limited treatment effects on hospitalization

among these patients. The cost of outpatient care at private sector providers was significantly lower than that at public medical facilities because public health care providers in China offer better services than private ones. Family size was negatively correlated with the cost of hospitalization and it did not affect the cost of outpatient care.

Role of medical insurance in promoting health

The above findings validated that medical insurance could increase medical expenses. To evaluate if the increase of medical expenditures was reasonable or exceeded the medical needs, the correlation between medical insurance and health state should be identified. If the health state of the insured significantly improved after participating in medical insurance, the medical expenses would be considered reasonable. Otherwise, the expenses would be considered excessive relative to medical needs. Indicators for the measurement of health status generally include survival time, health scales (e.g., activities of daily living (ADL), the quality of life (QOL) score, and self-rated health). According to the design of the CHARLS questionnaire, this study used survival time and self-rated health as indicators for health status.

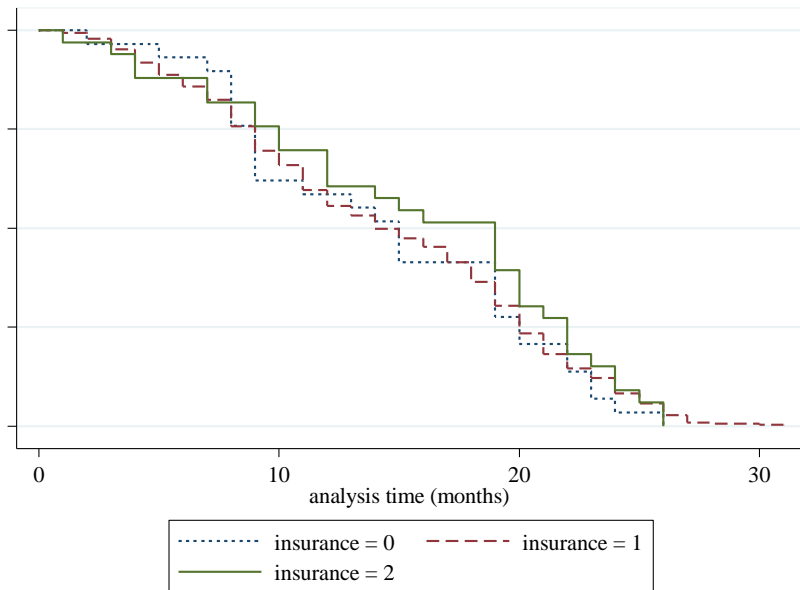


Fig. 2: Kaplan–Meier survival estimates

Medical insurance and survival time

CHARLS held in 2011 investigated 17,708 individuals and recorded 647 samples of death from 2011-2014. After removing the cases with no record at the time of death, 624 samples of death remained. The Kaplan–Meier survival curve showed that the survival of test subjects participating in one of the three medical insurance programs was very similar (Figure 2). To test the equality of the survivor function across groups, Chi-square test value was determined to be 0.67 ($P = 0.7139$), indicating no significant difference

in the survival of the residents who participated in different types of medical insurance.

In addition to medical insurance, survival is also affected by other factors (29, 30). Hence, the Cox's proportional hazards regression model for multifactorial regression analysis was used. Despite the independent variable of medical insurance, the gradual introduction of individual characteristics, health conditions, and lifestyle were estimated separately to assess the robustness of the regression model (Table 4).

Table 4: Cox regression to evaluate the effect of health insurance on survival

Independent variables	Dependent variable: survival time		
	Model III	Model IV	Model V
Type of insurance	0.5889 (0.3058)	0.6253 (0.3247)	0.3417 (0.4973)
Gender	0.9933 (0.2356)	1.0771 (0.2835)	0.7100 (0.1171)
Age (yr)	1.0258** (0.0122)	1.0279** (0.0126)	1.0542* (0.0425)
Place of residence	1.3983 (0.4484)	1.6895 (0.5647)	1.8050 (0.4748)
Marital status	1.2328 (0.4454)	1.2029 (0.4404)	1.1251 (1.6336)
Travel time	1.0022 (0.0031)	1.0018 (0.0032)	1.0027 (0.0084)
Work status	0.9943 (0.2353)	1.1471 (0.2818)	1.3037 (0.3011)
Household expenditures	0.9461* (0.0277)	0.9388* (0.0269)	0.9323* (0.0295)
Disability		1.1403** (0.2821)	1.1614** (0.1792)
Chronic disease		1.2843*** (0.2505)	1.2798*** (0.3332)
Health status		1.2344* (0.2135)	1.1727* (0.2656)
Physical examination			0.8201*** (0.2024)
Smoking habits			1.0790* (3.8756)
Drinking habits			1.1585 (0.3587)
Exercise habits			0.7766** (0.1198)
LR (Chi square)	17.33**	22.79***	32.02***
Number of observations	587	584	533

Note: 1) Data in the table represent hazard ratio, and the numbers in the parentheses represent standard deviations. 2) *, **, and *** denote the level of significance test by 10%, 5%, and 1%, respectively

In Table 4, the conclusions of different models were similar, indicating that the estimation of parameters was relatively stable. In Models III, IV, and V, medical insurance exerted no significant effect on the risk of death, which was consistent with the Kaplan–Meier survival estimation. Regarding the effect of the other control variables, the results of Model V in Table 4 showed that the risk of death increased by 5% for each year of age. The risk of death in disabled people was 16% higher than that in healthy individuals, and that in patients with chronic diseases increased by 28%. For subjects having a poor self-reported health status, the risk of death increased by 17%. Smoking and drinking increased the risk of death by 8% and 16%, respectively. Household expenditures, physical examinations, and exercise reduced the risk of death by 6%, 18%, and 22%, respectively. Other control variables, including gender, marital status, travel time, place of residence, and work status exerted no significant effect on the risk of death.

Medical insurance and self-rated health

Table 5 demonstrates the effect of medical insurance on self-rated health analyzed by the ordered probit model. To ensure the robustness of the model estimation and remove the type of insurance variable from Model VI, individual and family characteristics of the test subjects were added. In Model VII, health conditions of individuals were included as factors to be considered. In Model VIII, we further added lifestyle factors. Conclusions of the three models were very similar (Table 5), indicating that the estimation of parameters was relatively robust. The coefficient of type of insurance was negative, signifying that participation in more premium medical insurance plans facilitated the improvement of residents' health. Coefficients of variables, including marital status, disability, chronic disease, smoking habits, and travel time were significantly positive, implying that the self-rated health of married individuals was worse than those of single individuals. Self-rated health of disabled and patients with chronic diseases was worse than that of normal people. Smokers have worse self-rated health

than non-smokers have. Individuals who take farther commute to the health care delivery institution reported worse self-rated health than those who have shorter commute time. Coefficients of educational level, work status, and drinking habits were significantly negative. Individuals with higher education level reported better self-rated health. Self-rated health of unemployed was better than that of employed individuals. Self-rated health of individuals who consume alcohol was worse than that of non-drinkers. Independent variables, including gender, age, place of residence, household expenditures, living area, family size, physical examination, and exercise habits did not affect self-rated health.

Discussion

Difference between outpatient and hospitalization costs

The results of this study showed that a difference in China's medical insurance influences the cost of outpatient care and hospitalization. Medical insurance increased the cost of outpatient clinic visits by 38.6% and that of hospitalization by 72.6%. The major cause was due to the differences in the policy design of inpatient and outpatient reimbursement in the medical insurance system in China. The insured participating in medical insurance could not reimburse the cost of outpatient care (except for specific diseases) and could only reimburse a portion of the cost of hospitalization. Thus, participation in medical insurance affected the cost of hospitalization more than that of the outpatient clinic.

The average cost of outpatient service of residents with employee medical insurance was higher than that of residents with resident medical insurance as well as those without insurance coverage. These findings were associated with the design of personal accounts of employee medical insurance because this personal medical insurance account only covered medical expenses (including outpatient and inpatient care) but not other expenses. The higher cost of outpatient care of individuals with resident medical insurance than that of those without insurance coverage was

possibly due to the insured paying more attention to their health and having a higher consumption capacity than residents without any medical insurance. Nevertheless, the resident medical insur-

ance did not cover the cost of outpatient care. Thus, individuals with the resident medical insurance had more expenses for outpatient care.

Table 5: Ordered probit model evaluating the effect of health insurance on self-rated health

Independent variables	Dependent variable: health status		
	Model VI	Model VII	Model VIII
Type of insurance	-0.3189*** (0.050798)	-0.3423*** (0.0517)	-0.2786*** (0.0905)
Gender	-0.0550 (0.0362)	-0.0612* (0.0371)	0.1241 (0.0821)
Age	0.0017 (0.0020)	0.0009 (0.0020)	0.0003 (0.0035)
Place of residence	-0.0335 (0.0384)	0.0319 (0.0406)	-0.0013 (0.0689)
Marital status	0.1424*** (0.0521)	0.1364** (0.0533)	0.2183** (0.0871)
Educational level	-0.0794*** (0.0132)	-0.0748*** (0.0135)	-0.0819*** (0.0232)
Work status	-0.3537*** (0.0380)	-0.2932*** (0.0393)	-0.1933*** (0.0675)
Household expenditures	-0.0033 (0.0034)	-0.0029 (0.0035)	-0.0058 (0.0057)
Living area	-0.0005** (0.0002)	-0.0004 (0.0002)	-0.0001 (0.0004)
Family size	-0.0135 (0.0089)	-0.0077 (0.0092)	-0.0171 (0.0161)
Travel time	0.0101** (0.0051)	0.0084* (0.0051)	0.0075* (0.0057)
Disability		0.2895*** (0.0421)	0.1923*** (0.0718)
Chronic disease		0.3841 (0.0363)	0.4728*** (0.0626)
Physical examination			0.0638 (0.0558)
Smoking habits			0.3090*** (0.0799)
Drinking habits			-0.0897** (0.0386)
Exercise habits			-0.0035 (0.0223)
R ²	0.1549	0.1608	0.1837
LR (Chi-square)	226.88***	393.12***	167.64***
Number of observations	15245	13048	10430

Note: 1) Sample data represent the mixed data in 2011 and 2014. 2) Standard deviation is listed in parentheses. 3) *, **, and *** denote the level of significance test by 10%, 5%, and 1%, respectively.

According to the statistics of inpatient expenditures, the residents with the employee medical insurance had a significantly higher cost of hospi-

talization than residents with the resident medical insurance and those without insurance coverage. This higher hospitalization cost was mainly due

to the higher reimbursement rates of the employee medical insurance on inpatient care. However, no significant difference on the cost of hospitalization was found between residents with the resident medical insurance and those without insurance coverage. This finding was different from what we anticipated and could be explained based on the medical consumption habits of Chinese residents. Chinese residents without medical insurance coverage were usually impoverished or not paying much attention to their health. Given the expensive inpatient care in China, residents without medical insurance coverage would choose not to avail of the health care from hospitals when encountering minor illnesses. They were forced to choose health care from hospitals only when encountering critical illnesses. Based on the results of the sample selection, the survey only included health expenditure data for residents with critical illness without insurance coverage, thus showing higher inpatient expenses.

Difference among the selections of health indicators

This study showed that participation in different medical insurance programs exhibited no significant correlation with the insured's survival time but showed a significant effect on the insured's self-rated health. Although many studies showed a significant correlation between self-rated health and risk of death (31), self-rated health has been considered a good predictor of risk of death and morbidity (32). However, many differences exist between an individual's self-rated health and risk of death. Self-rated health presents strong subjectivity, instability, and comparability (32-36). These previous studies suggested that self-rated health might contain other unobservable health information of other health variables. Aside from risk of death, self-rated health should also consider whether test subjects had proper physical function and sense of physical and psychological ease. Self-rated health did not only measure the current fitness levels but also detected the changes in fitness levels as well as improved the possession of resources of health status. Self-

rated health reflected better quality of life. When studying the relationship between medical insurance and health care, selecting different indicators for health status might generate different results.

Improvement of health care system in China

China's existing medical insurance system focuses on the treatment of serious illnesses and disregards minor ailments and prevention. This scheme is exemplified by the medical insurance reimbursement policy requiring deductibles. The government only pays for the amount above the deductible in a claim. The insured must also pay for preventive medical expenses. The design of this insurance policy aims to ensure that the medical insurance coverage is for treating serious illnesses. This study showed that having medical insurance did not reduce the risk of death or prolong survival time but only significantly improved the self-rated health of residents in China. We propose that the Chinese government should spend more medical resources on minor ailment treatment and disease prevention to reduce reimbursement rates for critical illnesses, thus spending medical resources on improving the health status of Chinese residents.

Conclusion

This study used CHARLS data to reasonably evaluate the growth of medical expenses caused by medical insurance and confirmed that medical insurance is an important factor for the growth of medical expenses. However, the increase in medical expenses did not significantly extend lives but improved the self-rated health of the insured, indicating that the increase in medical consumption caused by medical insurance was only partially effective. Based on this conclusion, this study suggests that the Chinese government should change its policy of subsidizing the treatment of serious illnesses at the expense of other conditions in medical insurance and provide more medical resources for treating minor ailments and preventing diseases to improve the health status of Chinese residents.

Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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